

Figure 1. Block Diagram of Interactive Virtual Reality Process Control

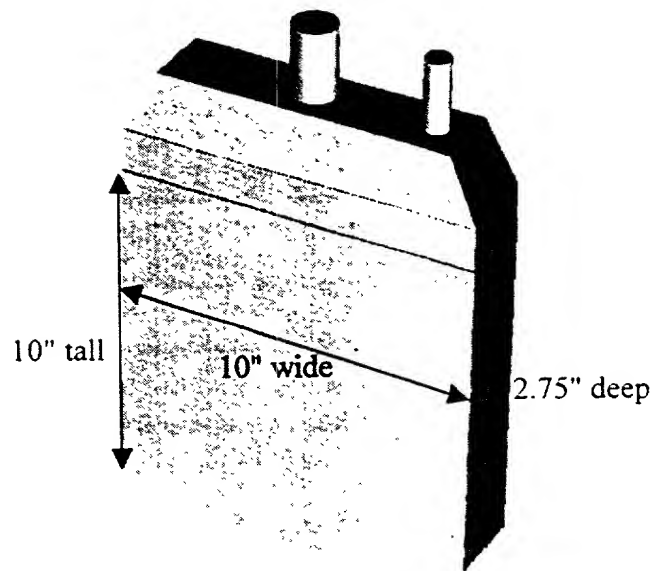
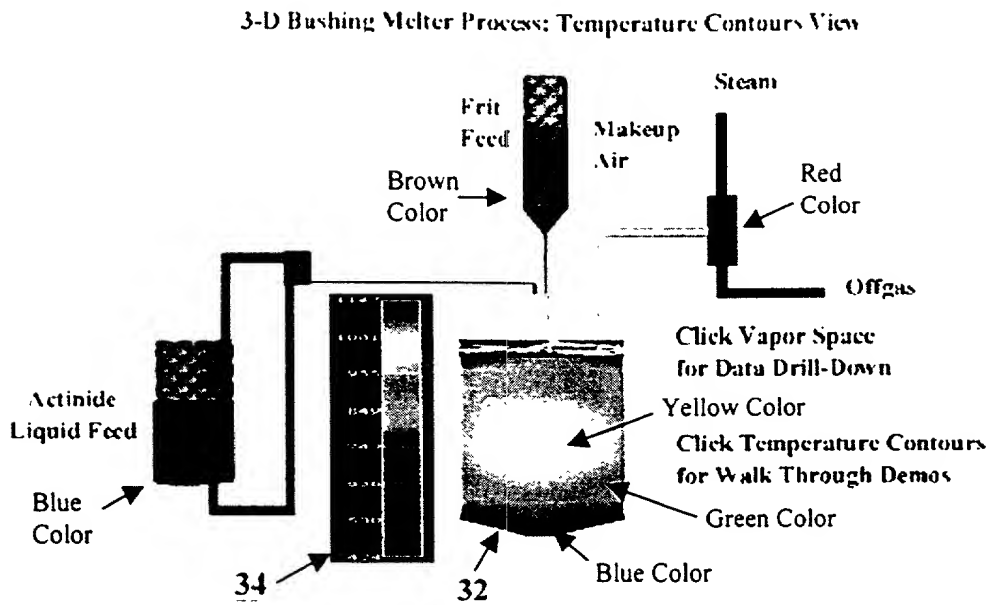
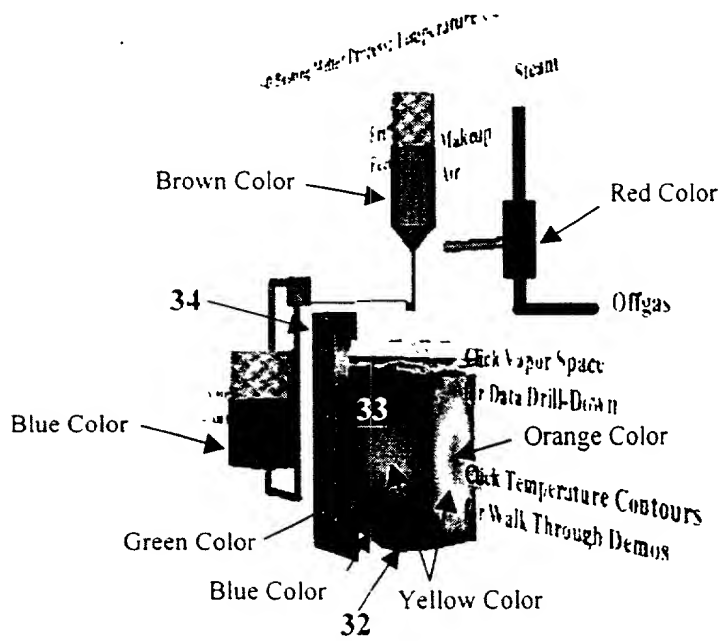


Figure 2. Bushing Melter Example



**Figure 3. 3-D Process Overview Interactive IVR-3D world Example showing front of bushing melter process**



**Figure 4. 3-D Process Overview Interactive IVR-3D world Example showing right front of bushing melter process**

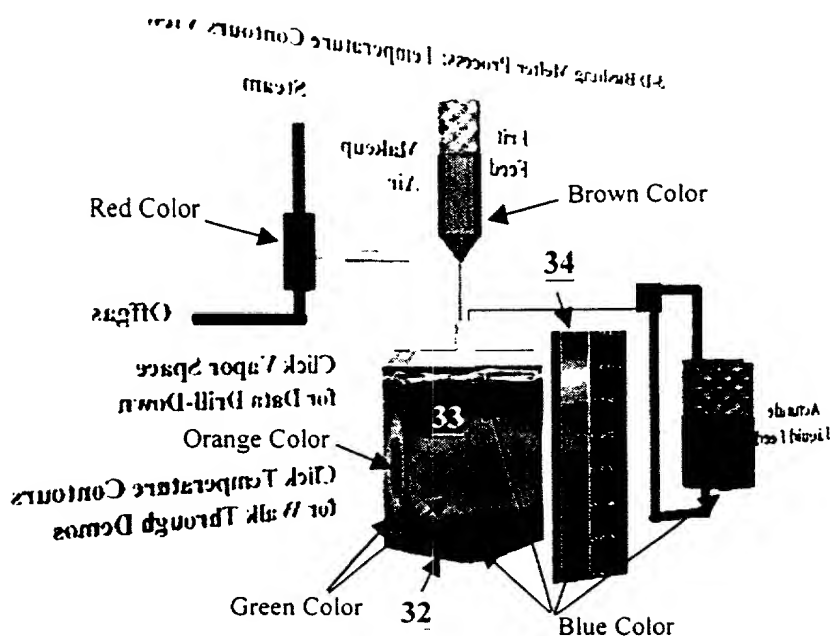


Figure 5. 3-D Process Overview Interactive IVR-3D world Example showing back left of bushing melter process

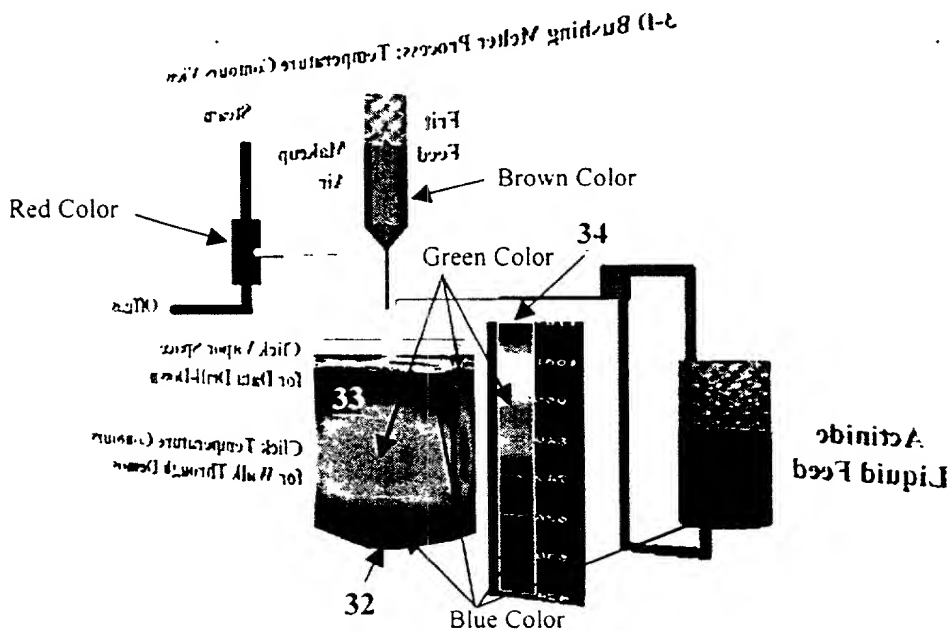


Figure 6. 3-D Process Overview Interactive IVR-3D world Example showing back right of bushing melter process

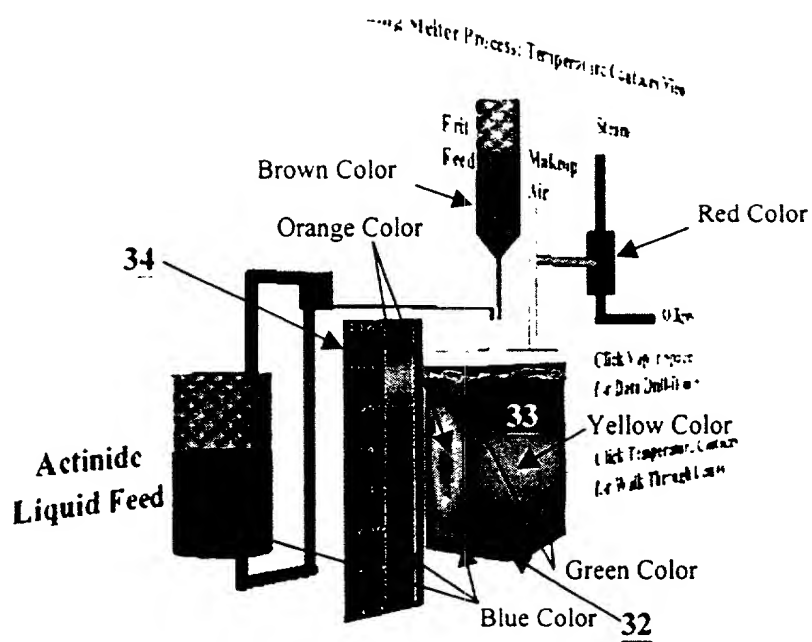


Figure 7. 3-D Process Overview Interactive IVR-3D world Example showing Left Front of bushing melter process

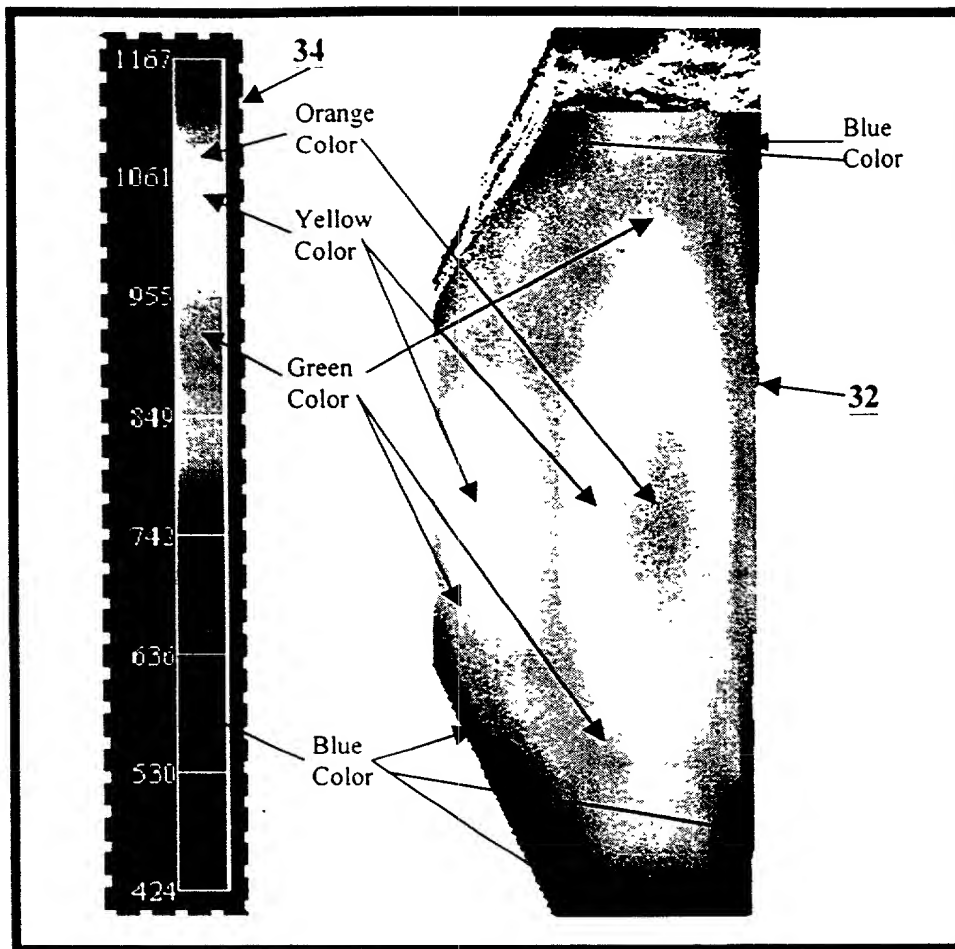


Figure 8. Right Side of Bushing Melter showing front with Temperature Legend as floating palette

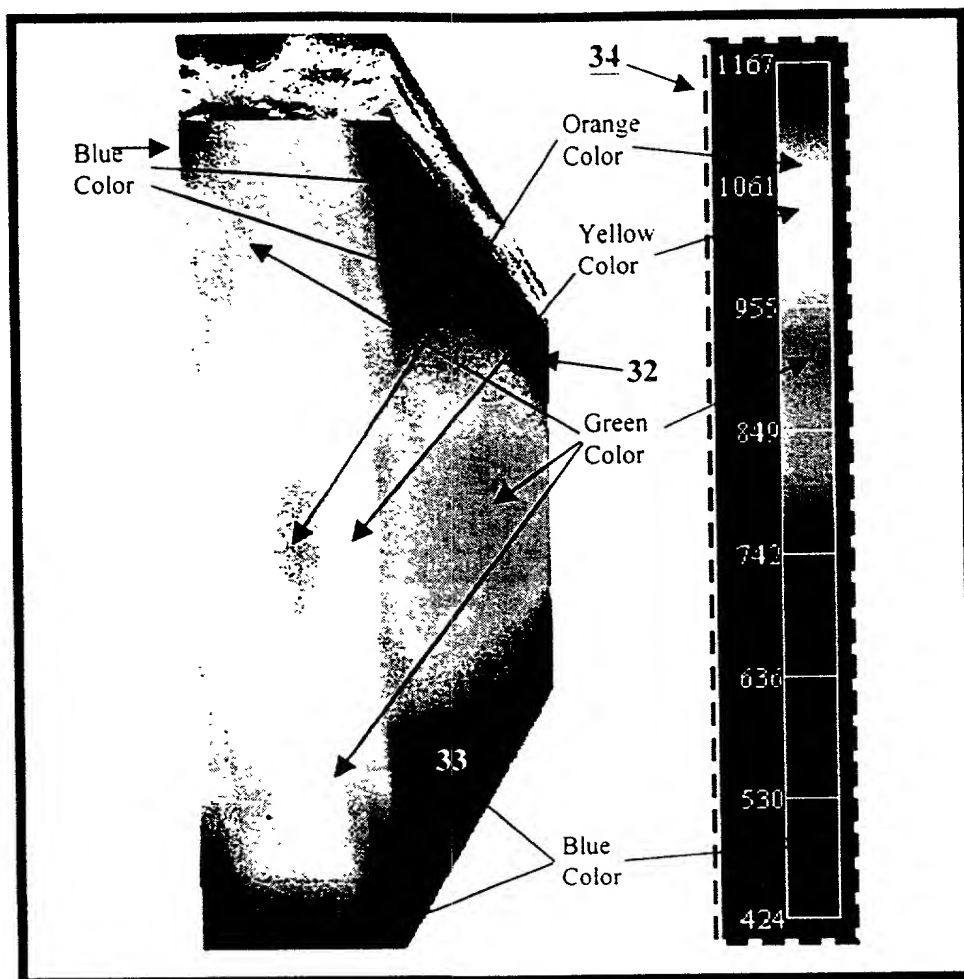


Figure 9. Right Side of Bushing Melter showing back with Temperature Legend as floating palette

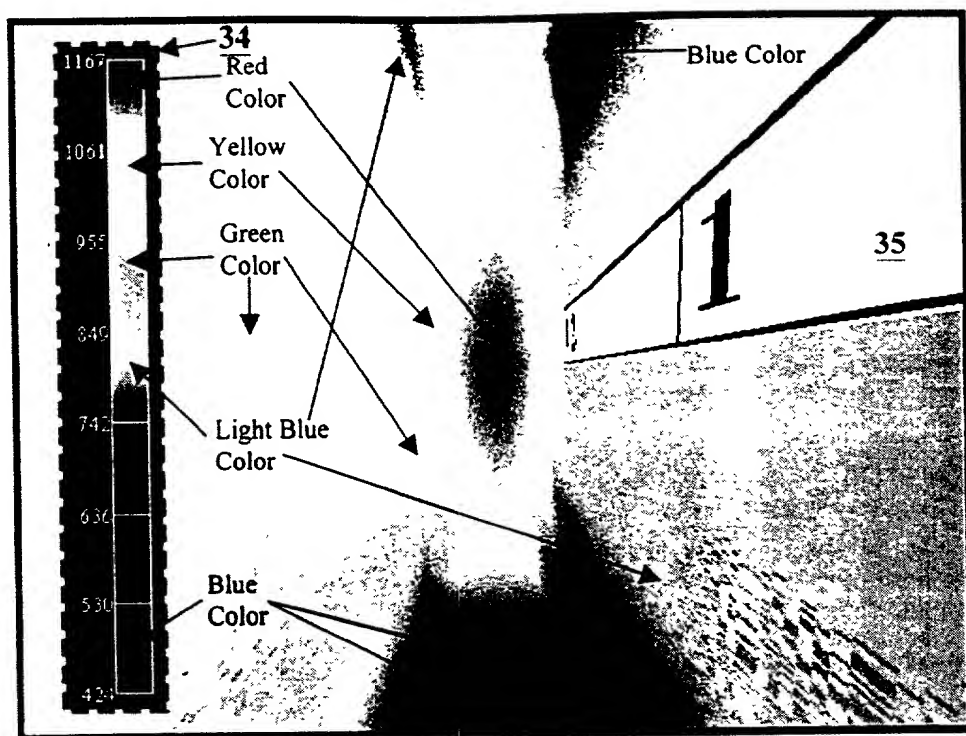


Figure 10. Inside Right Side of Melter by 2 inches with floating Temperature Legend

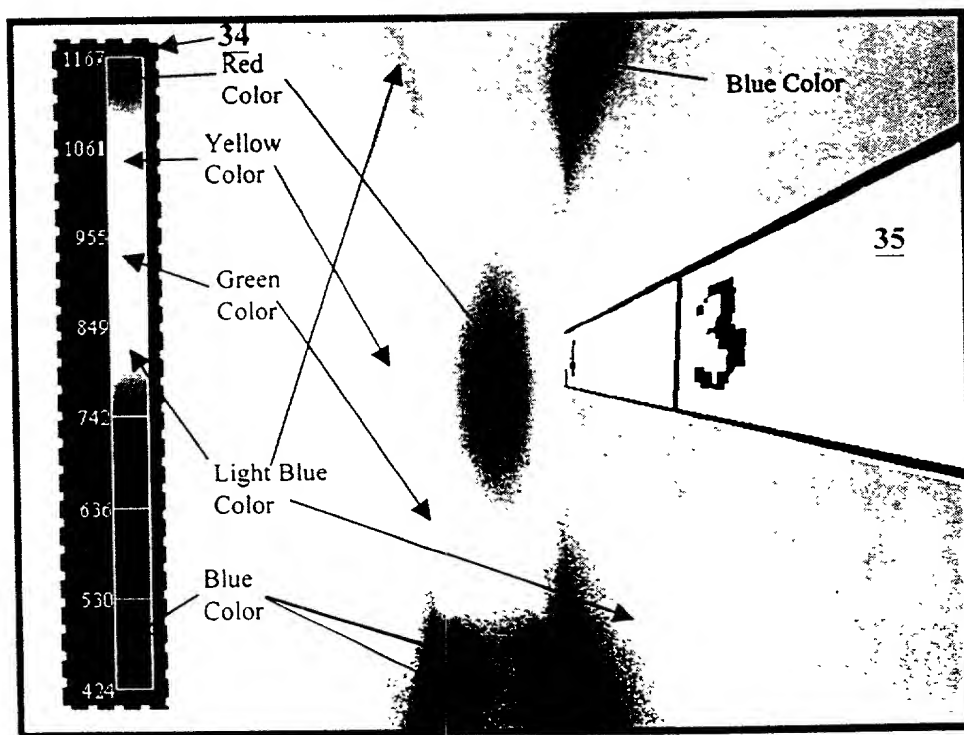


Figure 11. Inside Right Side of Melter by 4 inches with floating Temperature Legend



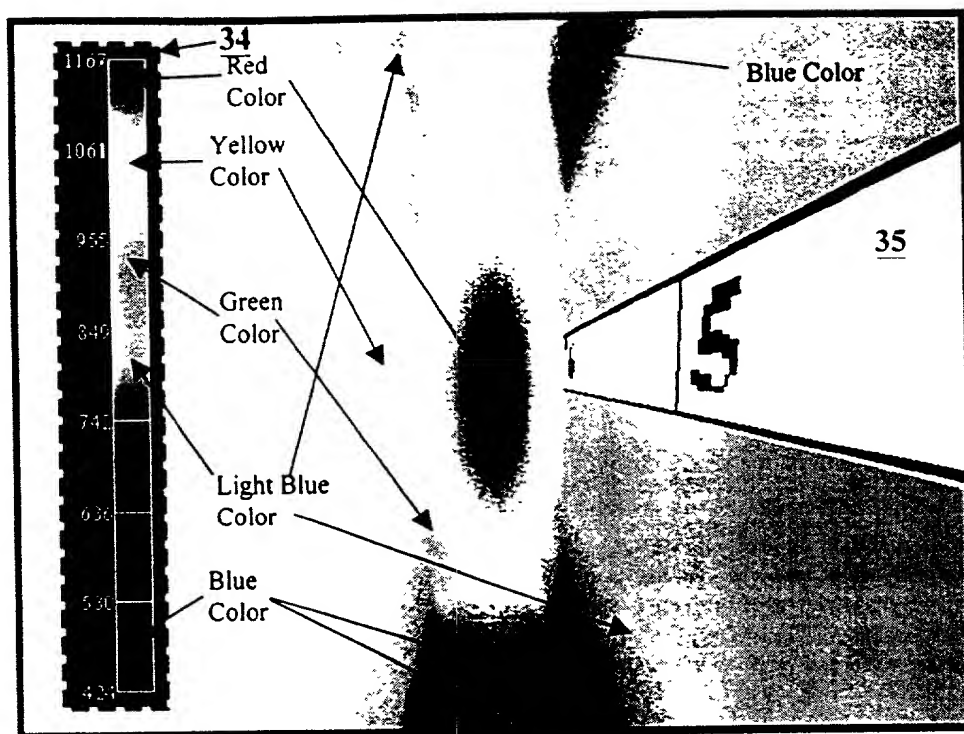


Figure 12. Inside Right Side of Melter by 6 inches with floating Temperature Legend

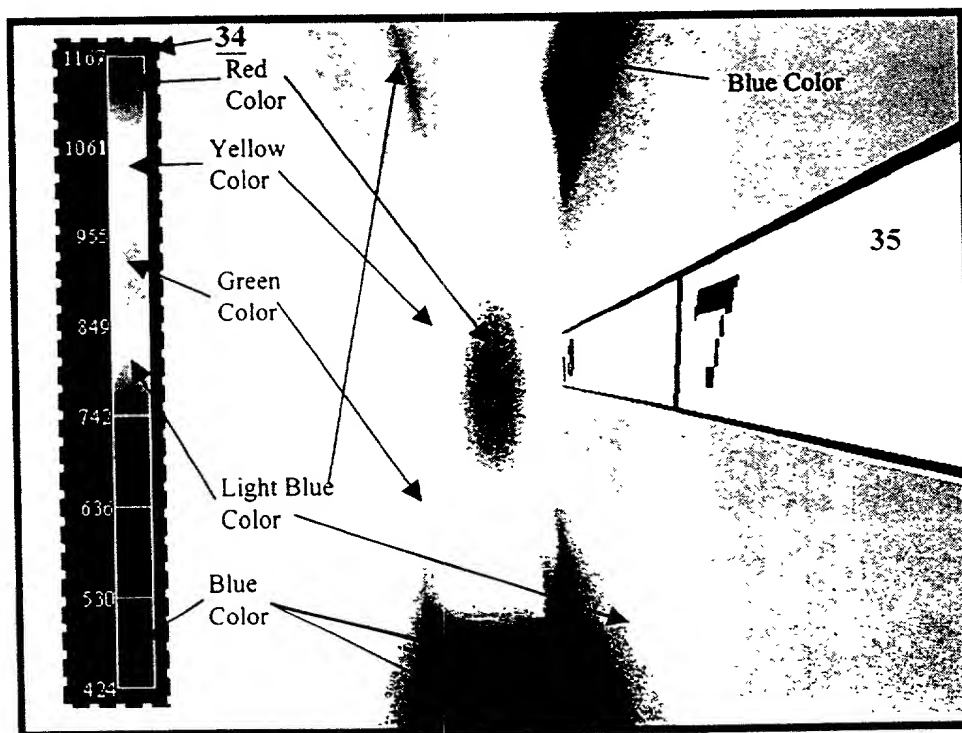


Figure 13. Inside Right Side of Melter by 8 inches with floating Temperature Legend

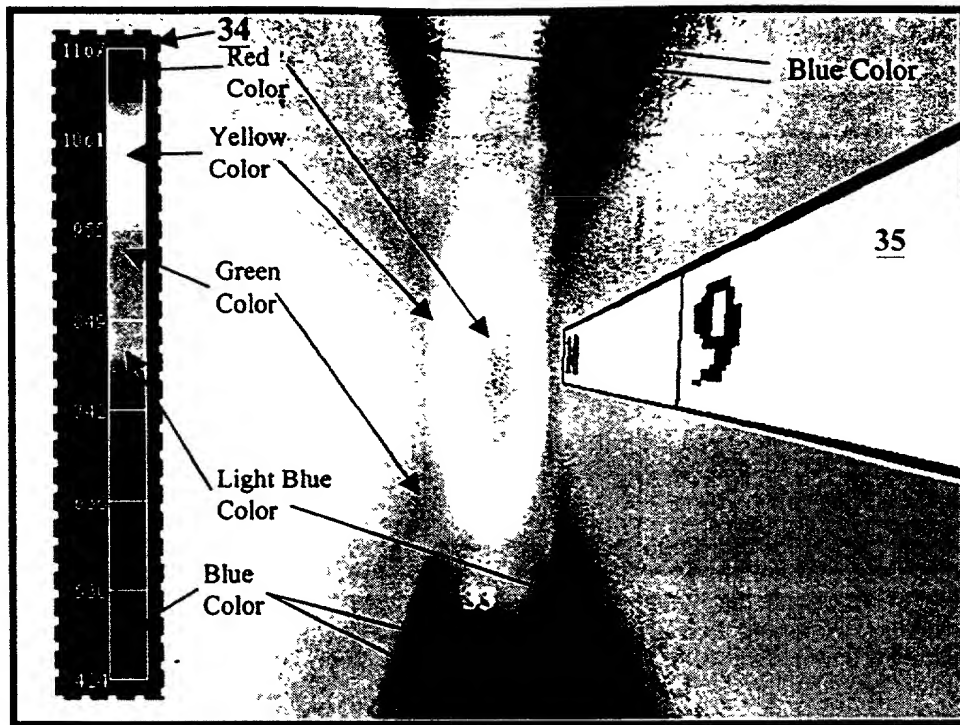


Figure 14. Inside Right Side of Melter by 10 inches with floating Temperature Legend

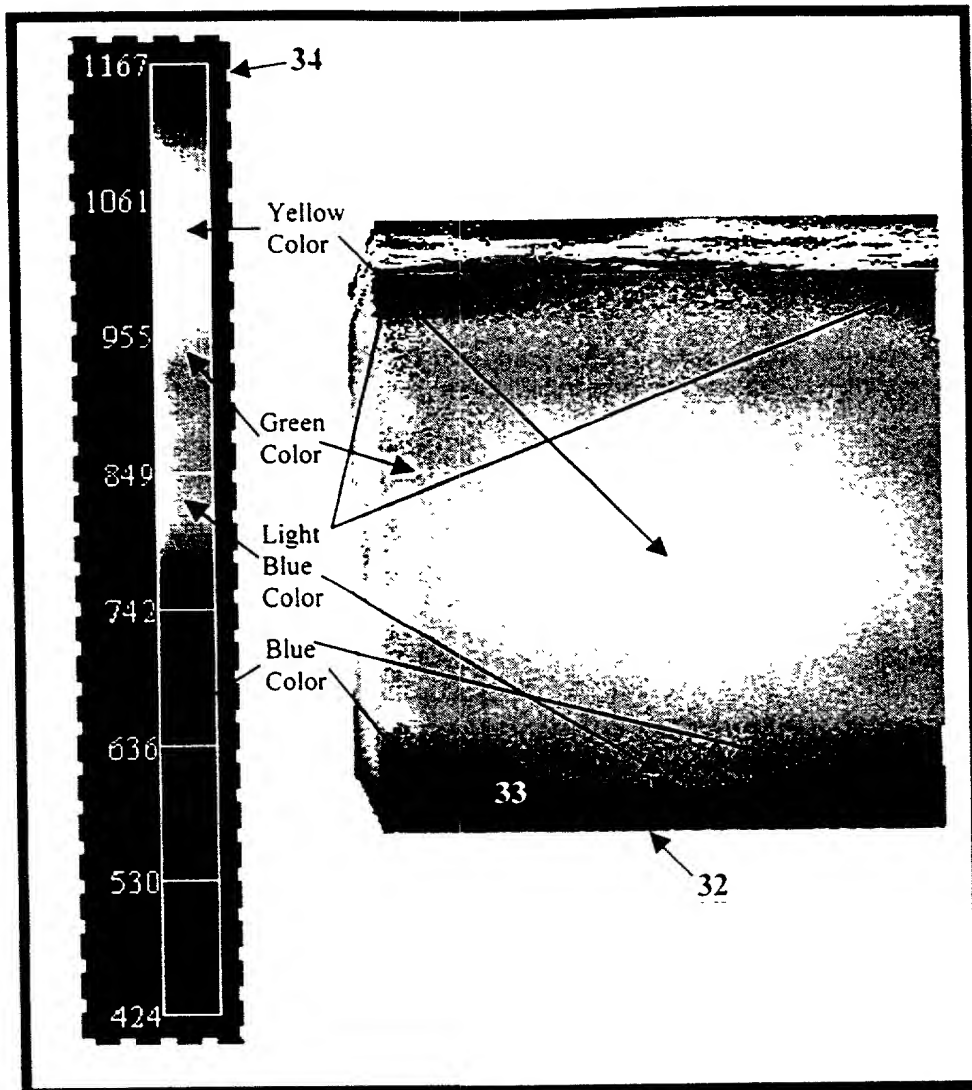


Figure 15. Front of Bushing Melter showing Left Side with Temperature Legend as floating palette

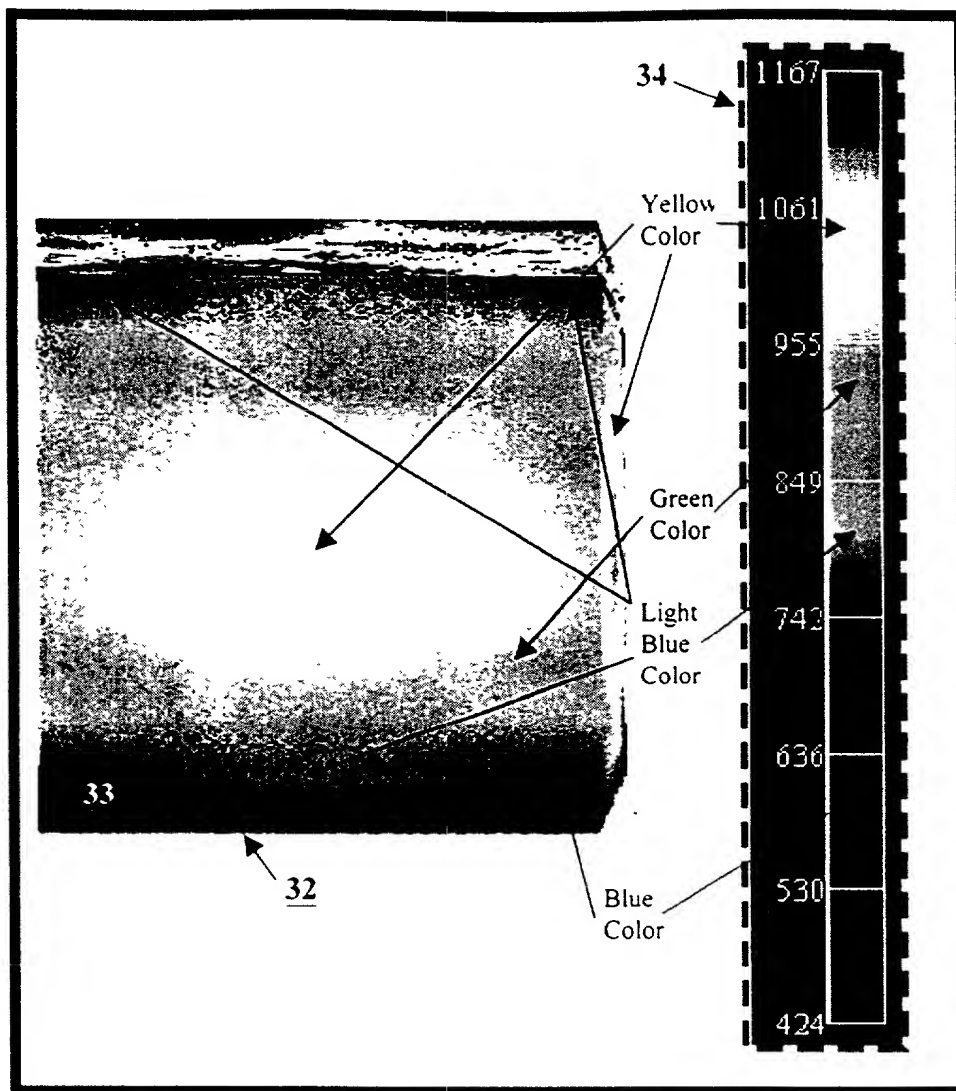


Figure 16. Front of Bushing Melter showing Right Side with Temperature Legend as floating palette

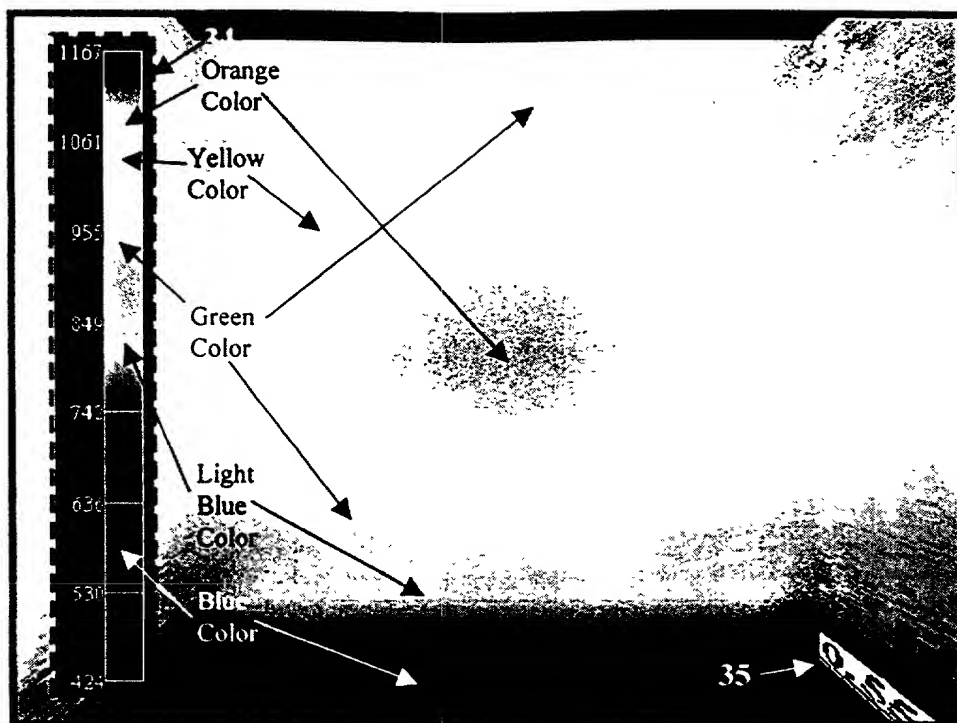


Figure 17. Inside Front of Melter by 0.55 inches with floating Temperature Legend

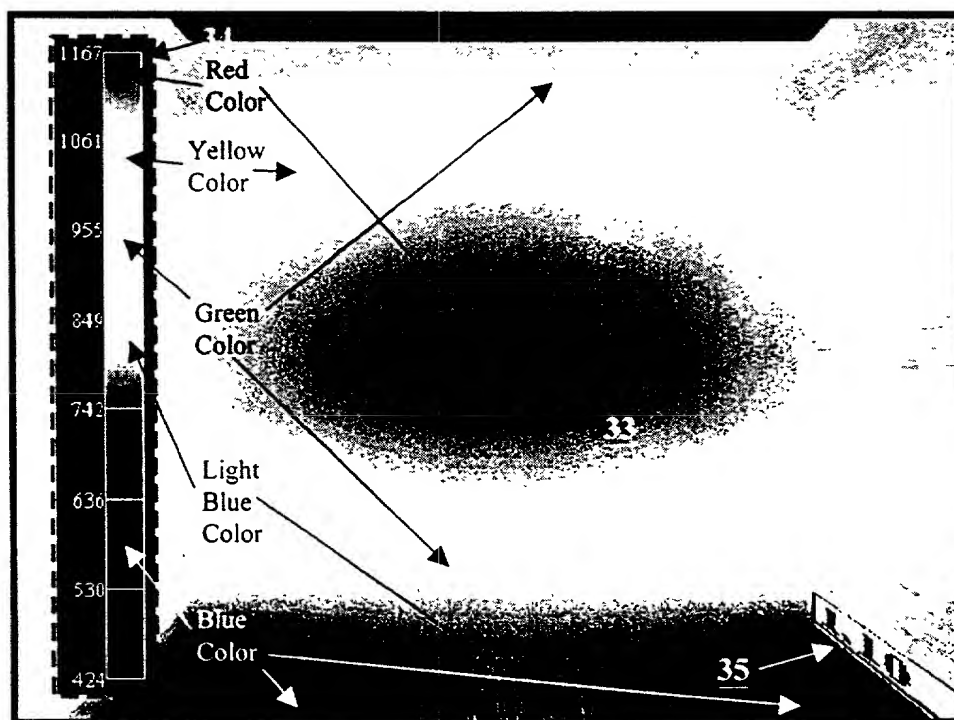


Figure 18. Inside Front of Melter by 1.10 inches with floating Temperature Legend

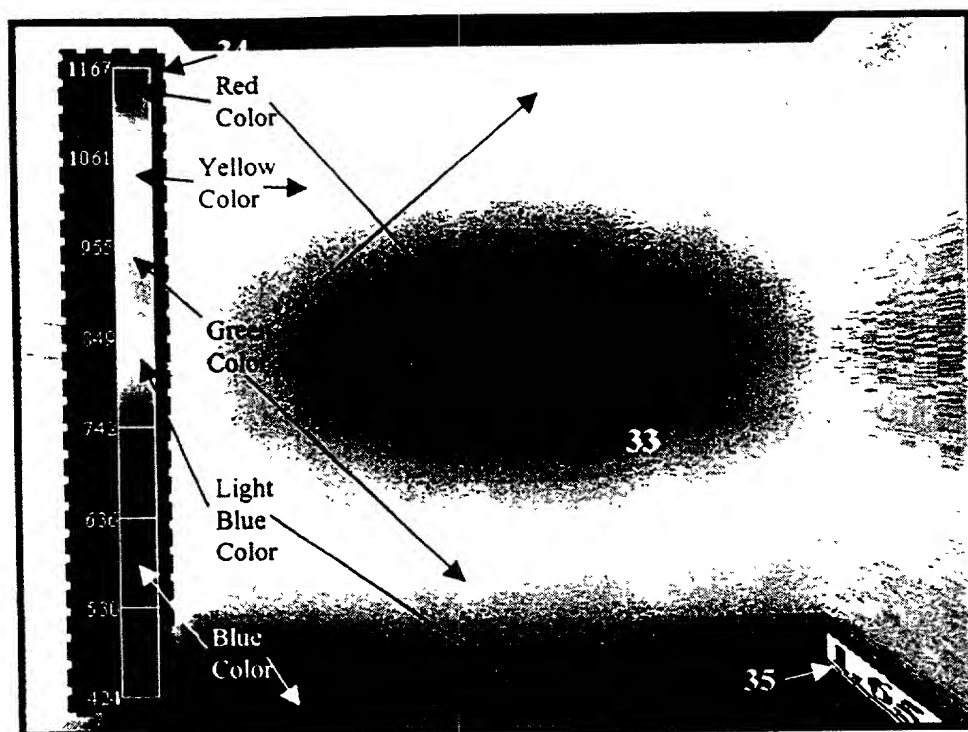


Figure 19. Inside Front of Melter by 1.65 inches with floating Temperature Legend

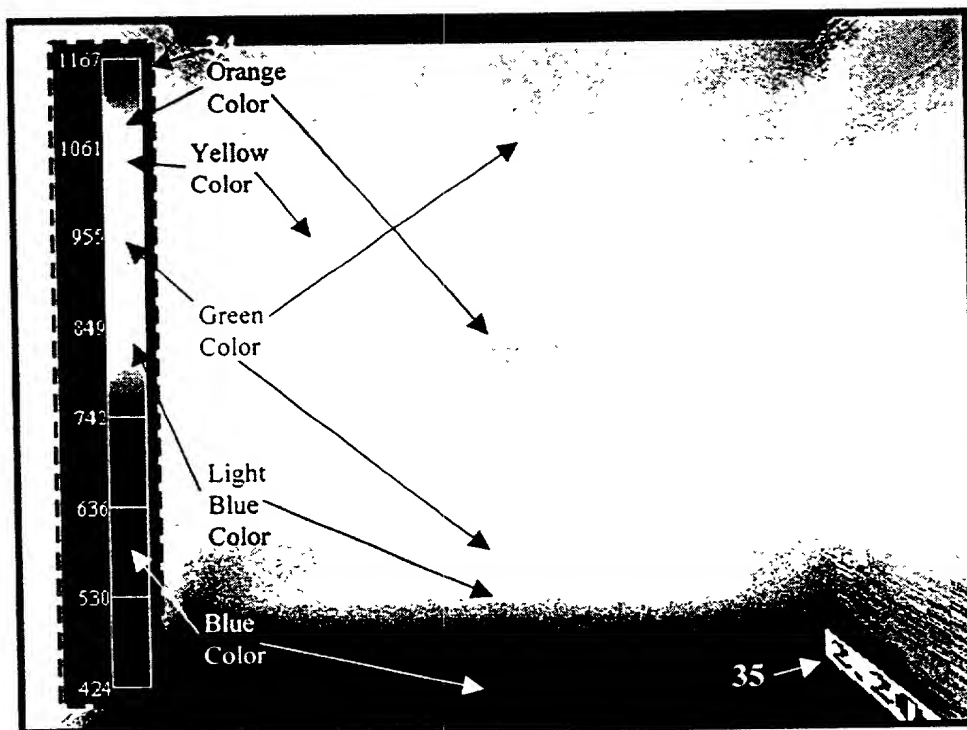


Figure 20. Inside Front of Melter by 2.20 inches with floating Temperature Legend

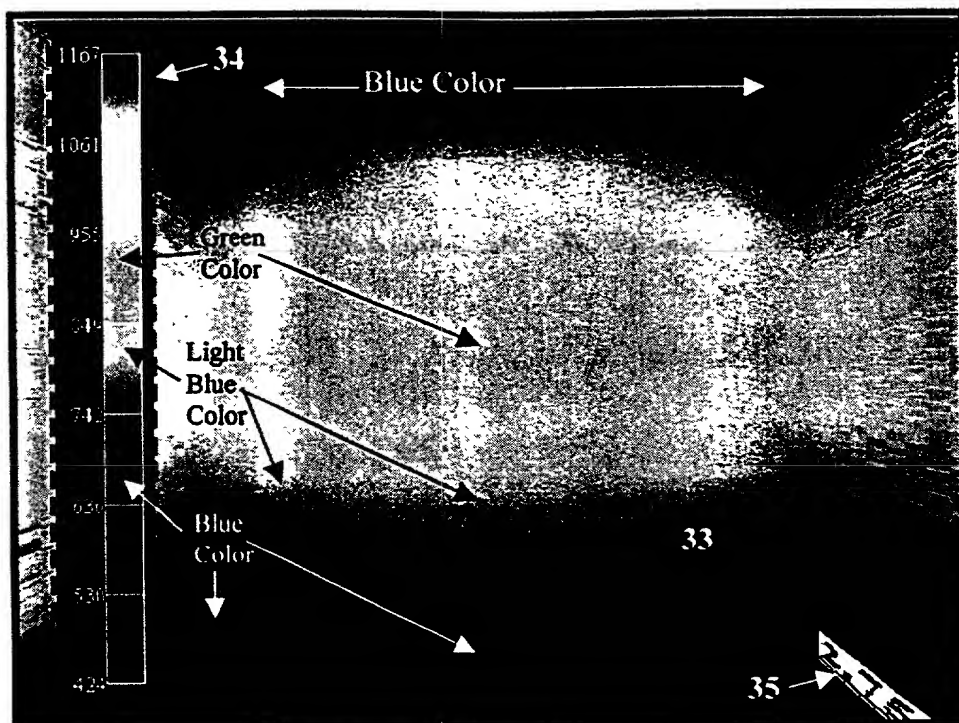


Figure 21. Inside Front of Melter by 2.75 inches with floating Temperature Legend

### Melter Vapor Pressure and System Interactions

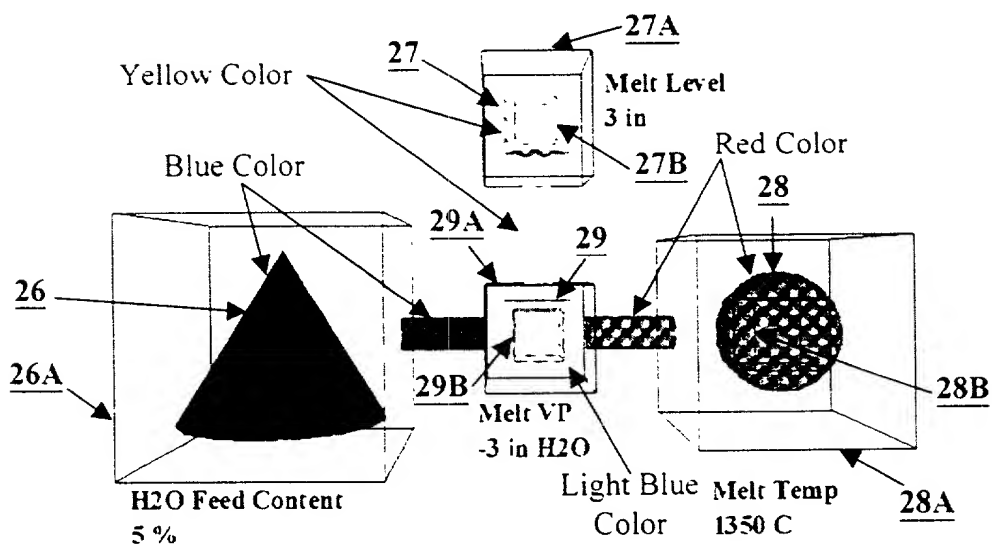


Figure 22. Front View of Variable Interaction IVR-3D world at Time Step 0

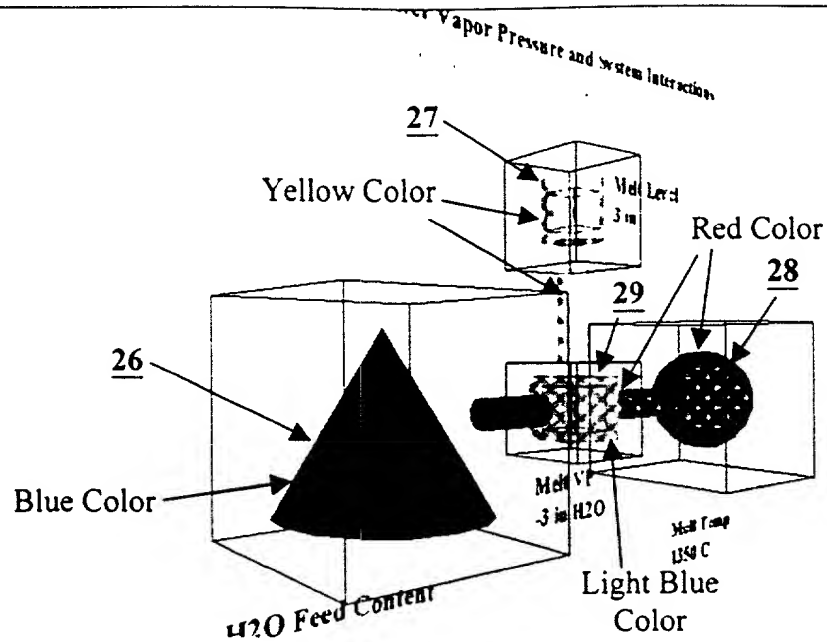


Figure 23. Front Left View of Variable Interaction IVR-3D world at Time Step 0

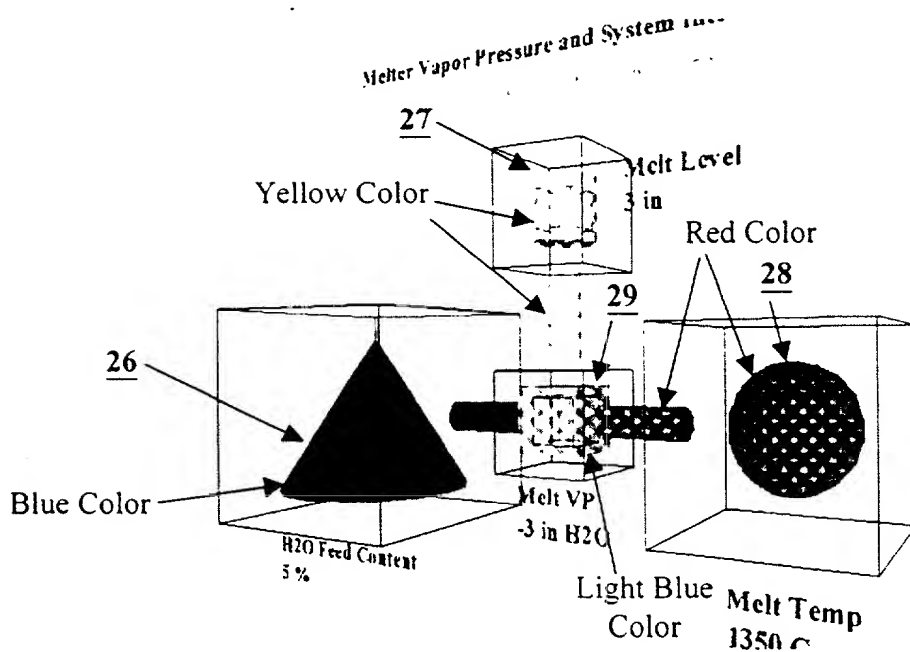


Figure 24. Front Right View of Variable Interaction IVR-3D world at Time Step 0



Melter Vapor Pressure and System Interactions

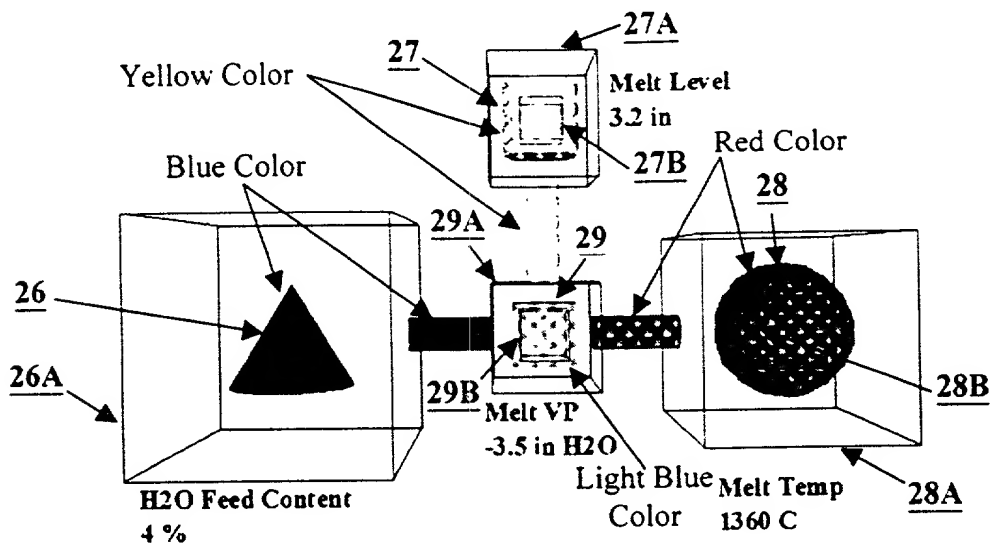


Figure 25. Front View of Variable Interaction IVR-3D world at Time Step 1

Melter Vapor Pressure and System Interactions

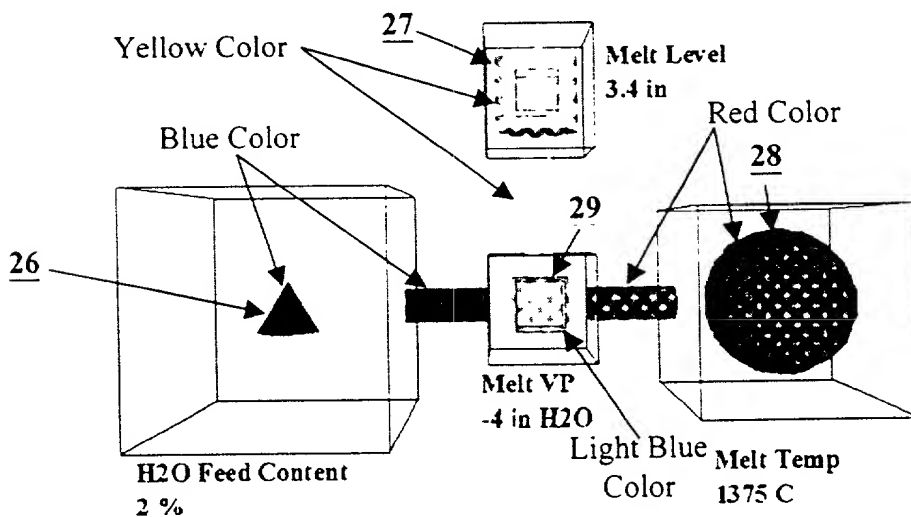


Figure 26. Front View of Variable Interaction IVR-3D world at Time Step 2

Melter Vapor Pressure and System Interactions

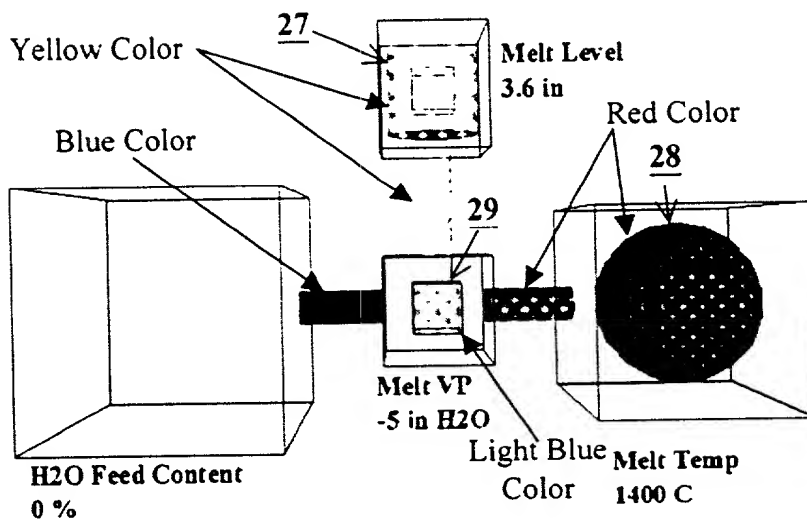


Figure 27. Front View of Variable Interaction IVR-3D world at Time Step 3

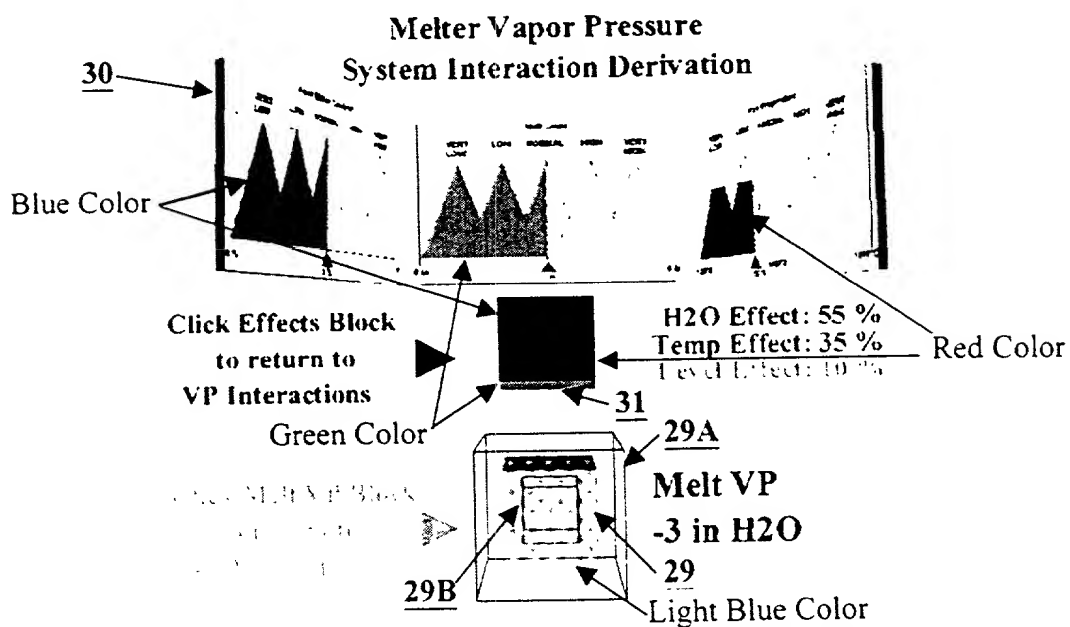


Figure 28. Front View of Detailed Derivation IVR-3D world at Time Step 0

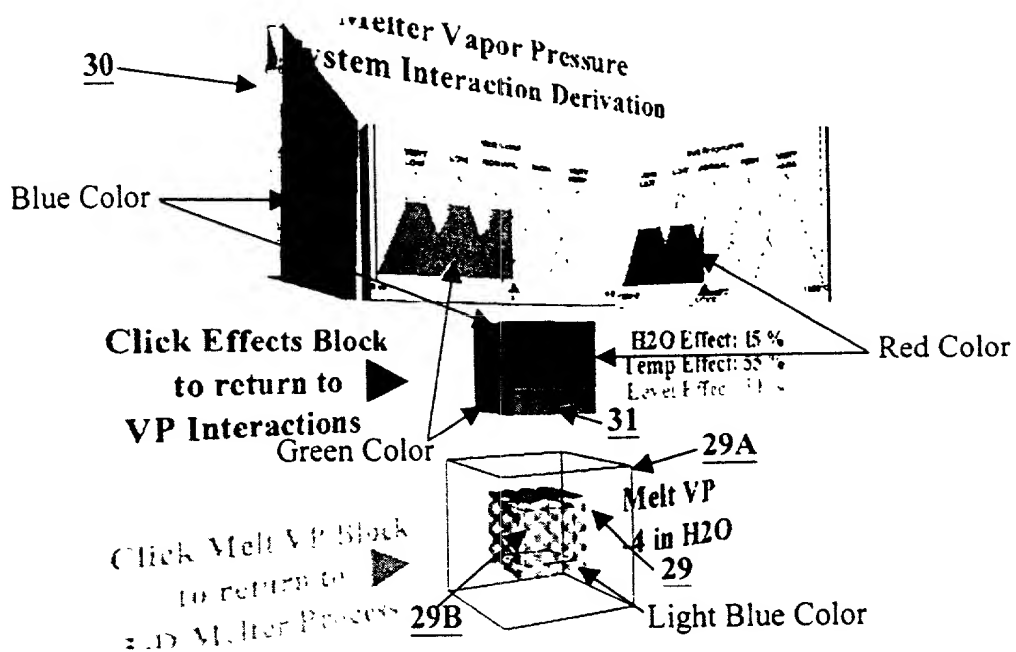


Figure 29. Front Left View of Detailed Derivation IVR-3D world at Time Step 0

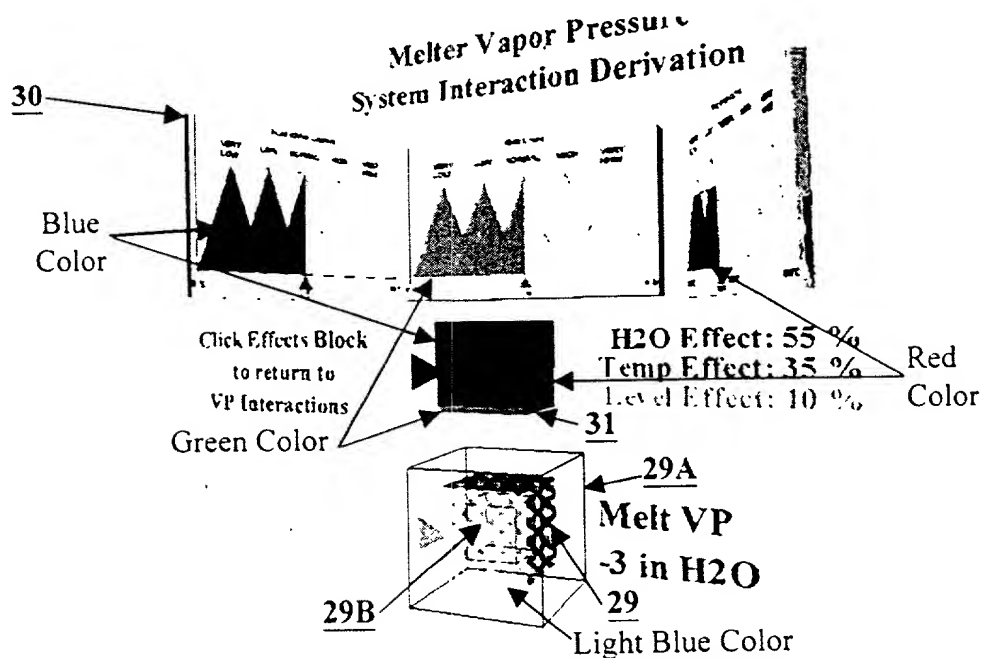


Figure 30. Front Right View of Detailed Derivation IVR-3D world at Time Step 0

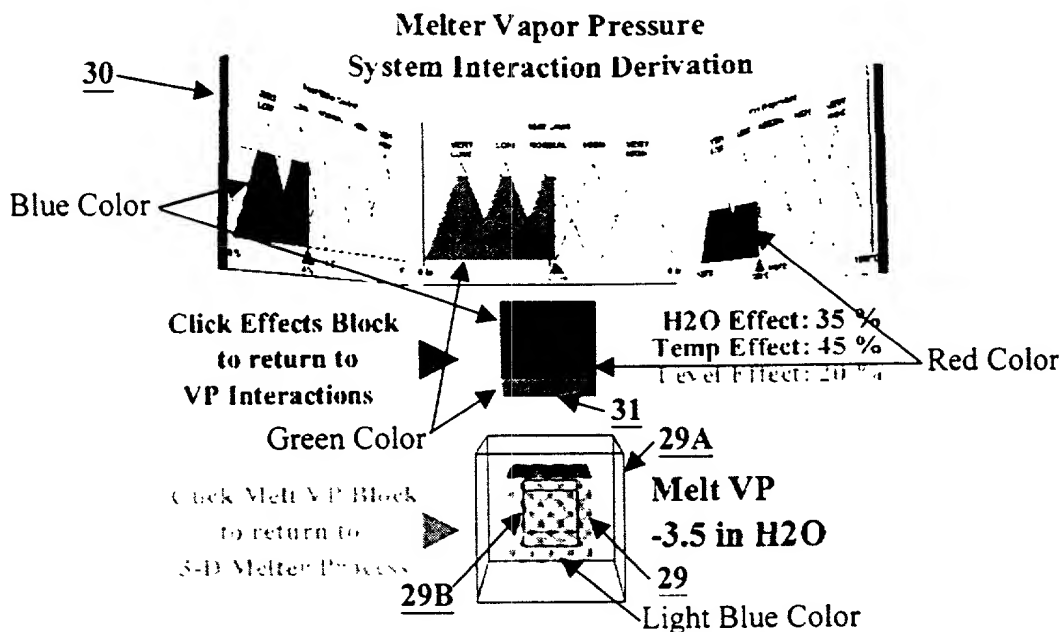


Figure 31. Front View of Detailed Derivation IVR-3D world at Time Step 1

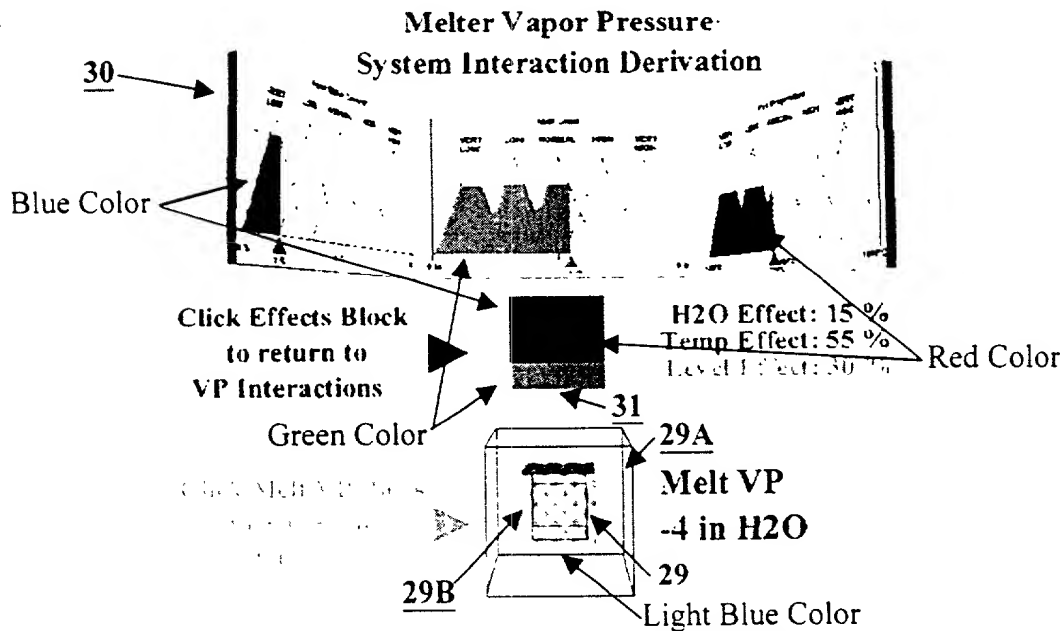


Figure 32. Front View of Detailed Derivation IVR-3D world at Time Step 2

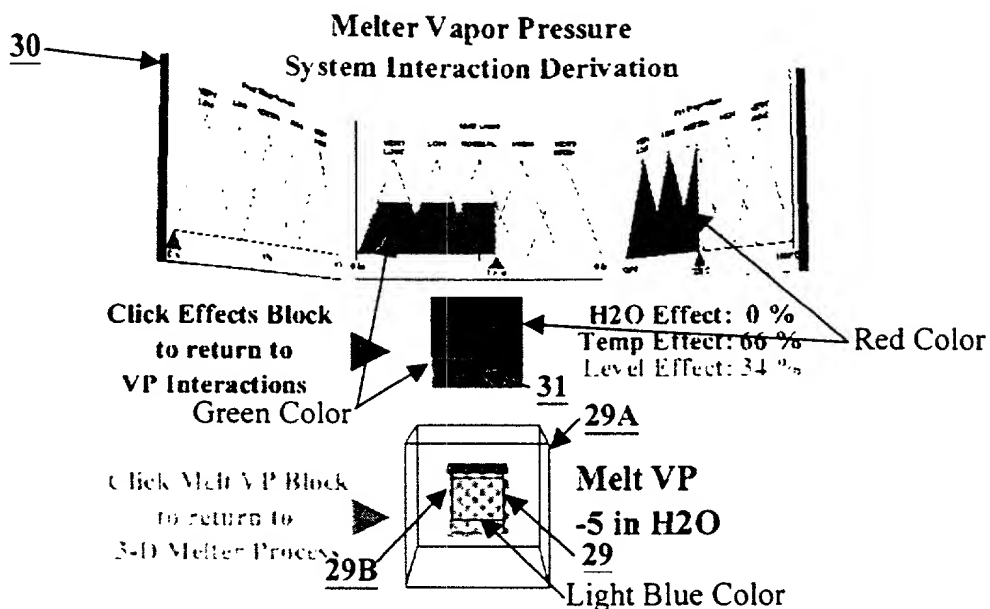


Figure 33. Front View of Detailed Derivation IVR-3D world at Time Step 3

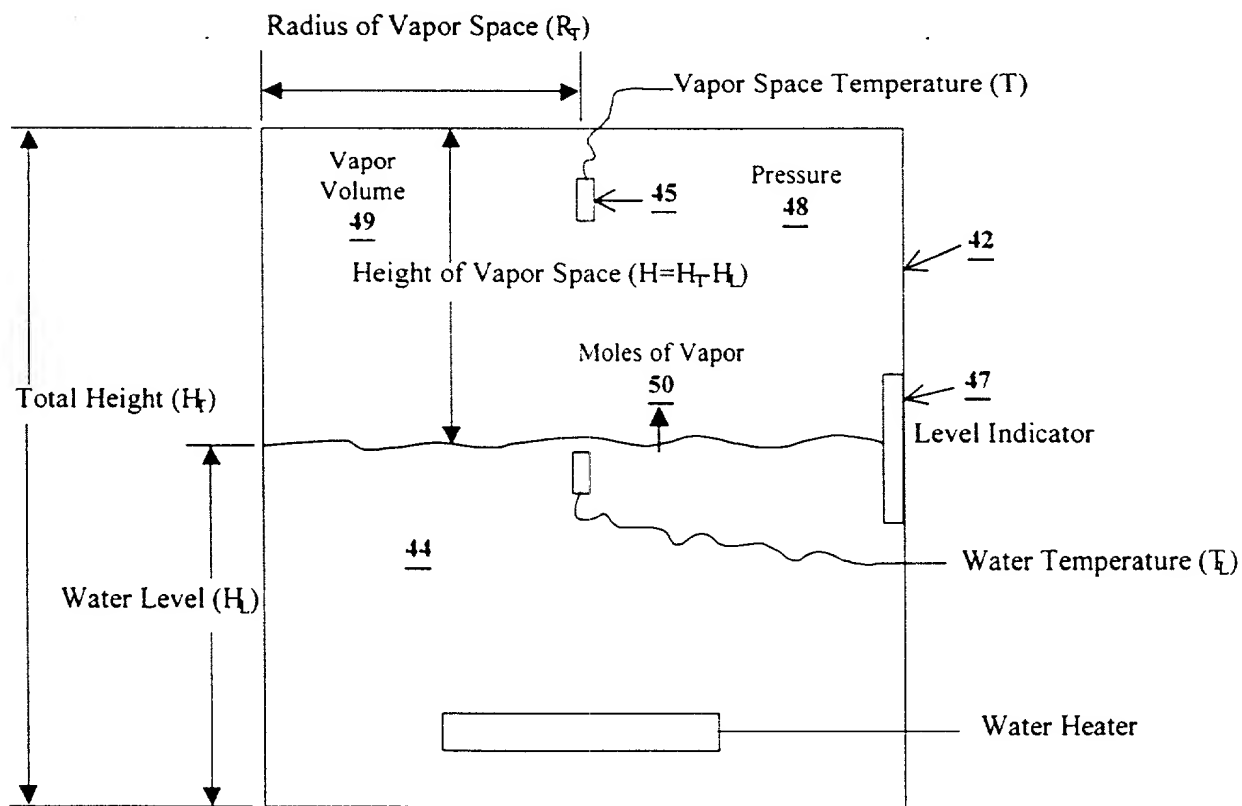
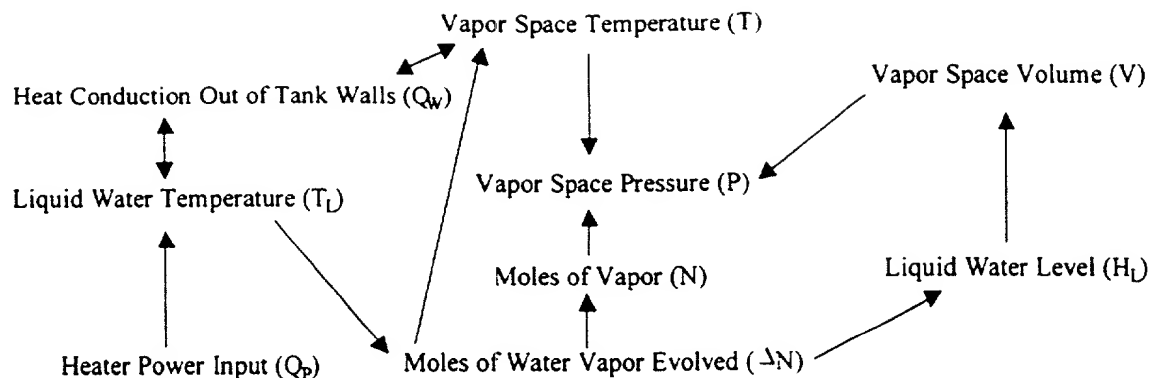
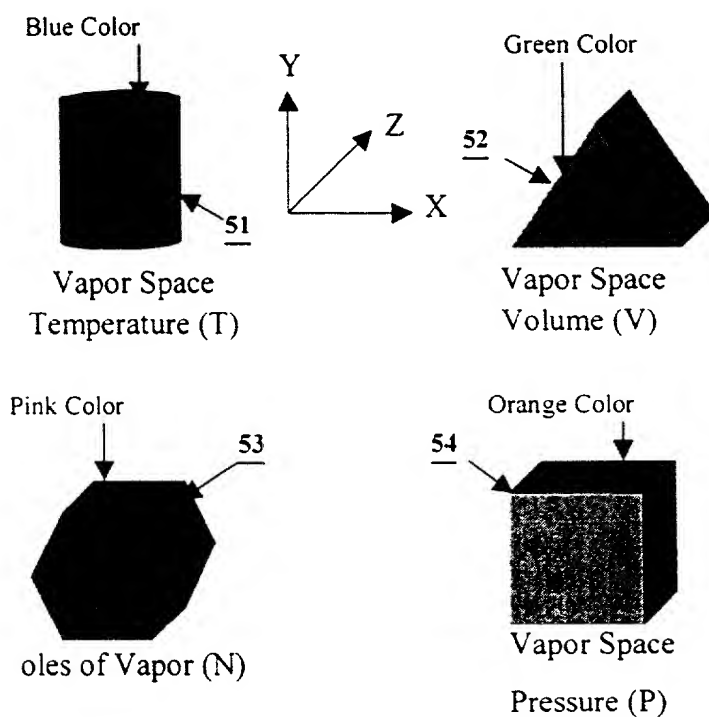


Figure 34. Understanding Vapor Space Pressure Overview



**Figure 35. Inter-linked Variable Description for System**



**Figure 36. Identify Unique Shapes and Colors for System Variables**

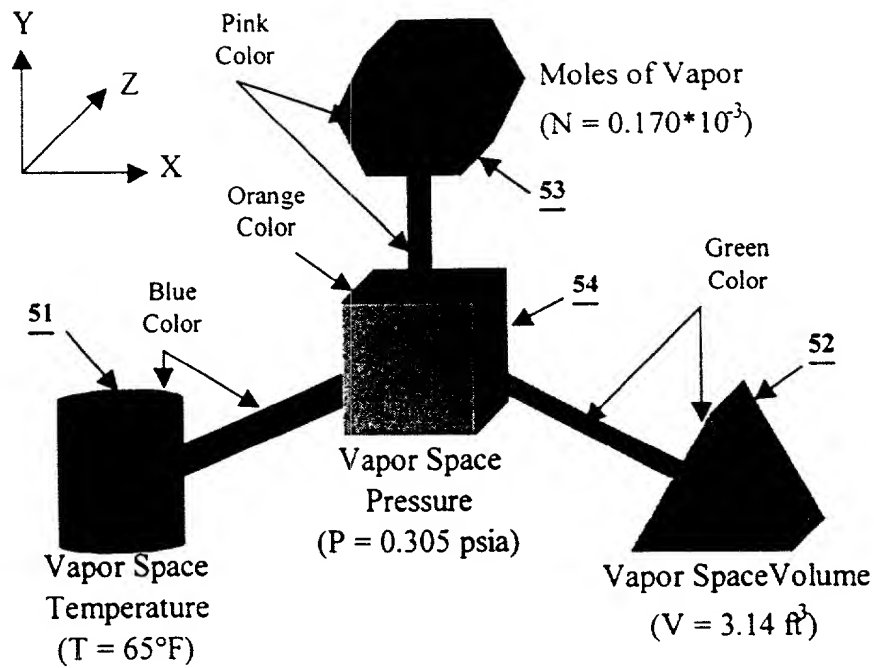


Figure 37. Virtual Reality 3-Dimensional World of Dependent and Independent Variables

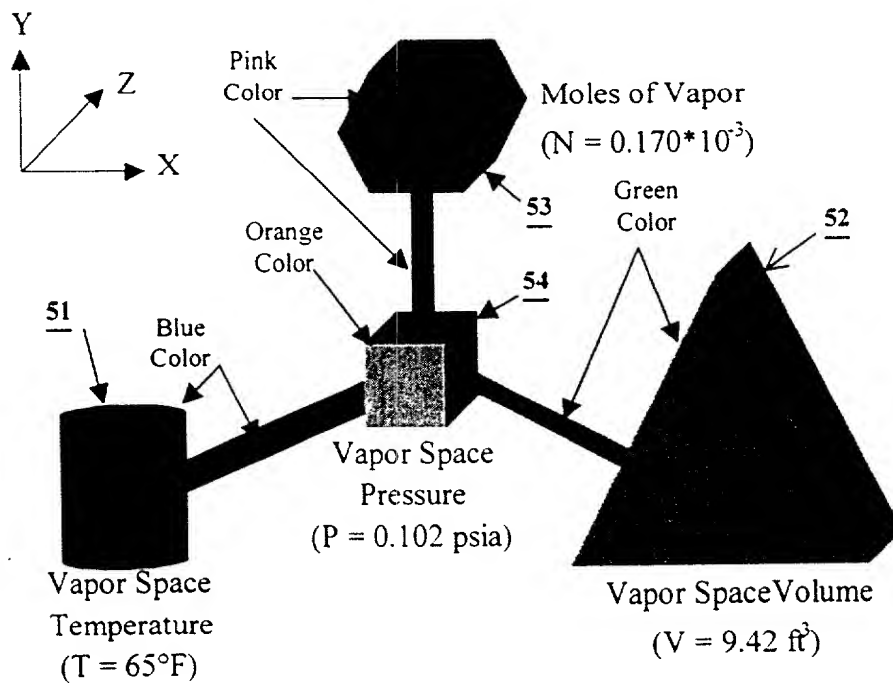


Figure 38. Increased Vapor Space Volume Effect

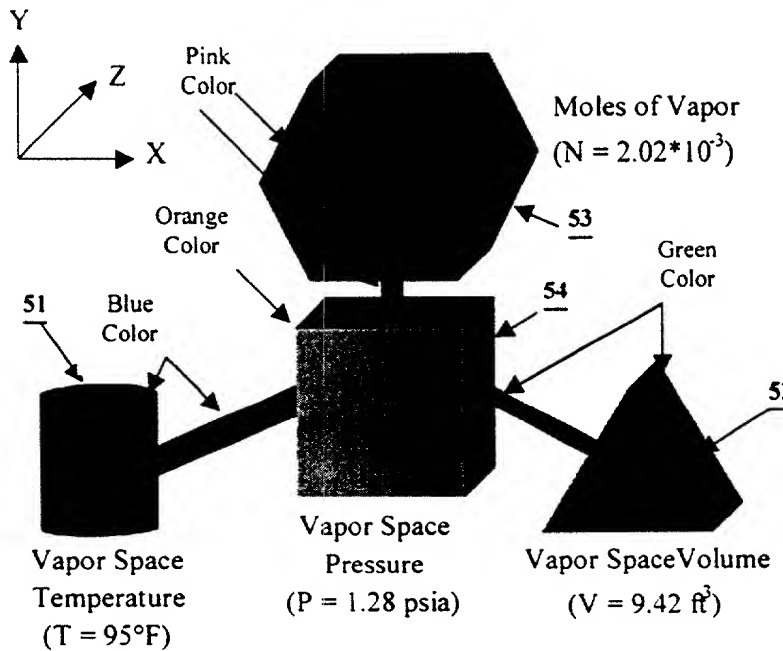


Figure 39. Increased Moles of Vapor and Vapor Space Temperature Effect

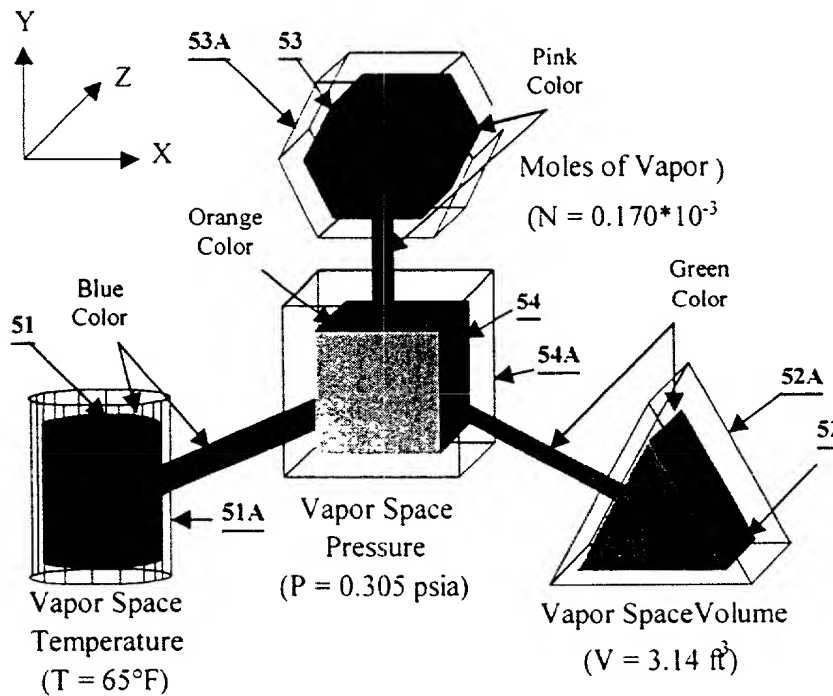
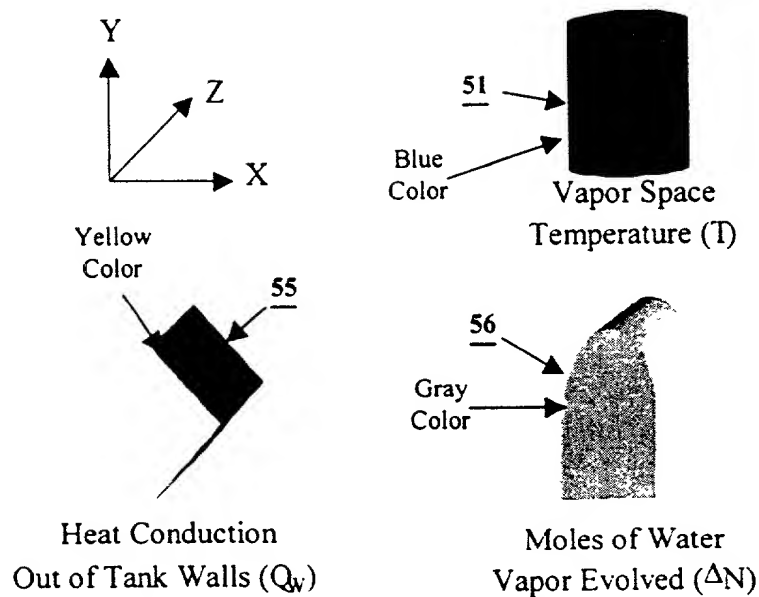
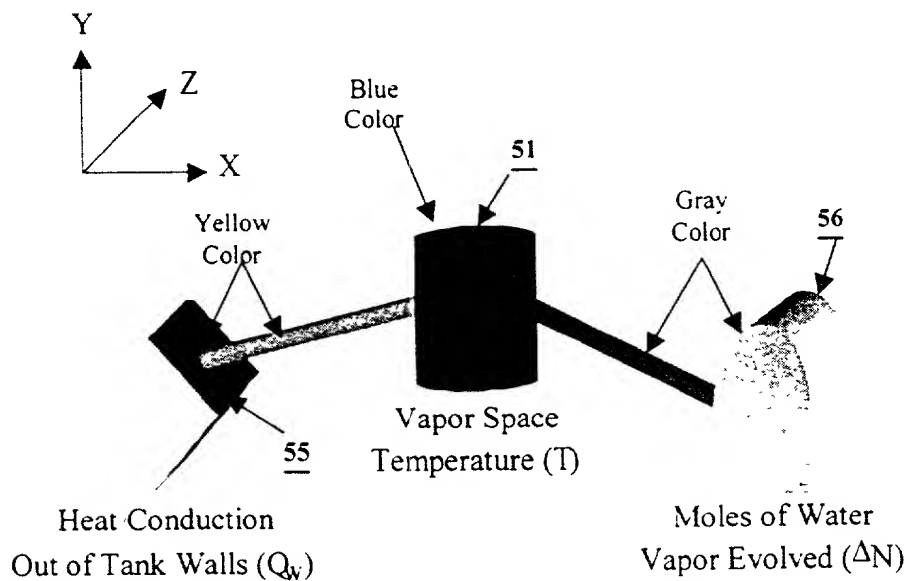


Figure 40. Upper Limits of System Variables

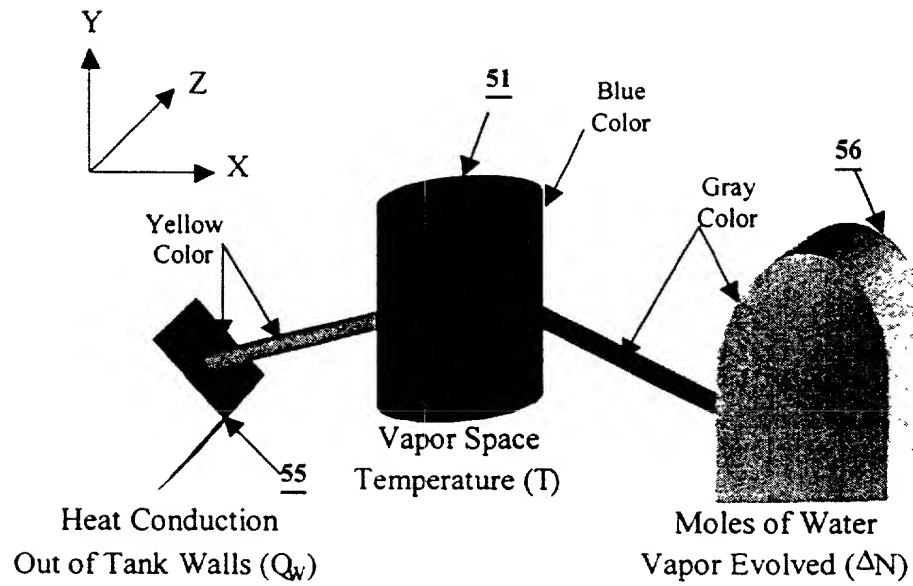




**Figure 41. Identify Unique Shapes and Colors for Vapor Space Temperature Example**



**Figure 42. Vapor Space Temperature Virtual Reality World of Dependent and Independent Variables**



**Figure 43.** Increased Water Evolution Effect

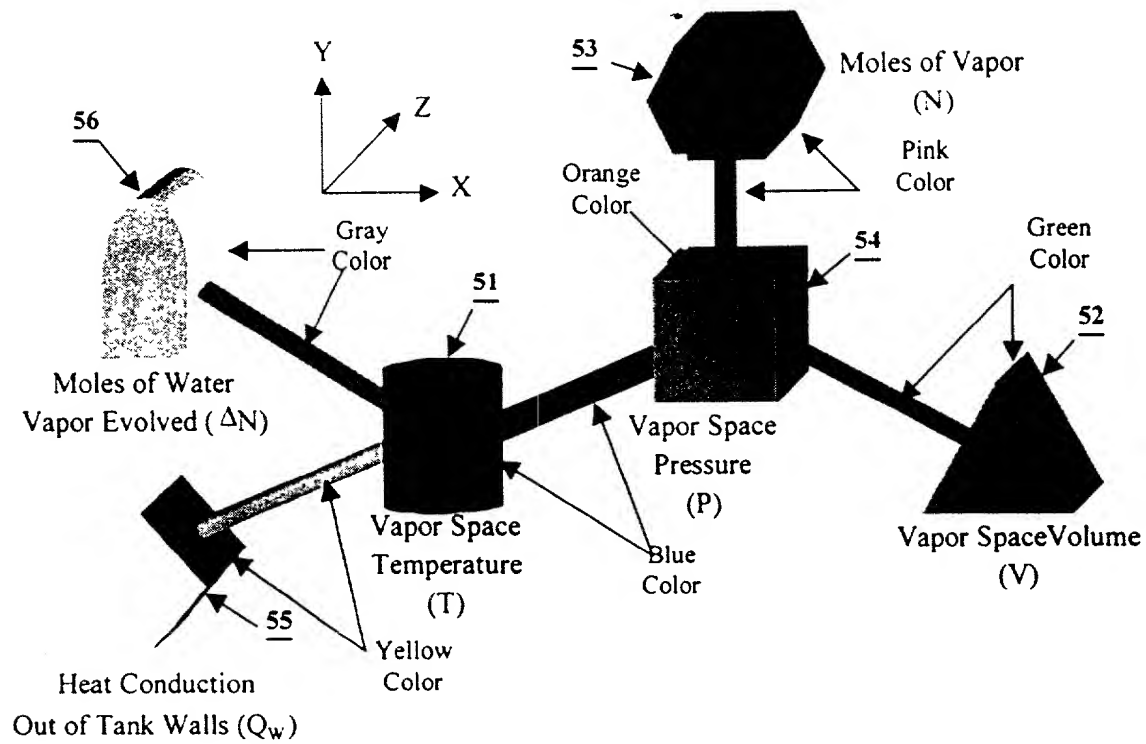


Figure 44. Virtual Reality Universe of Inter-linked System variables

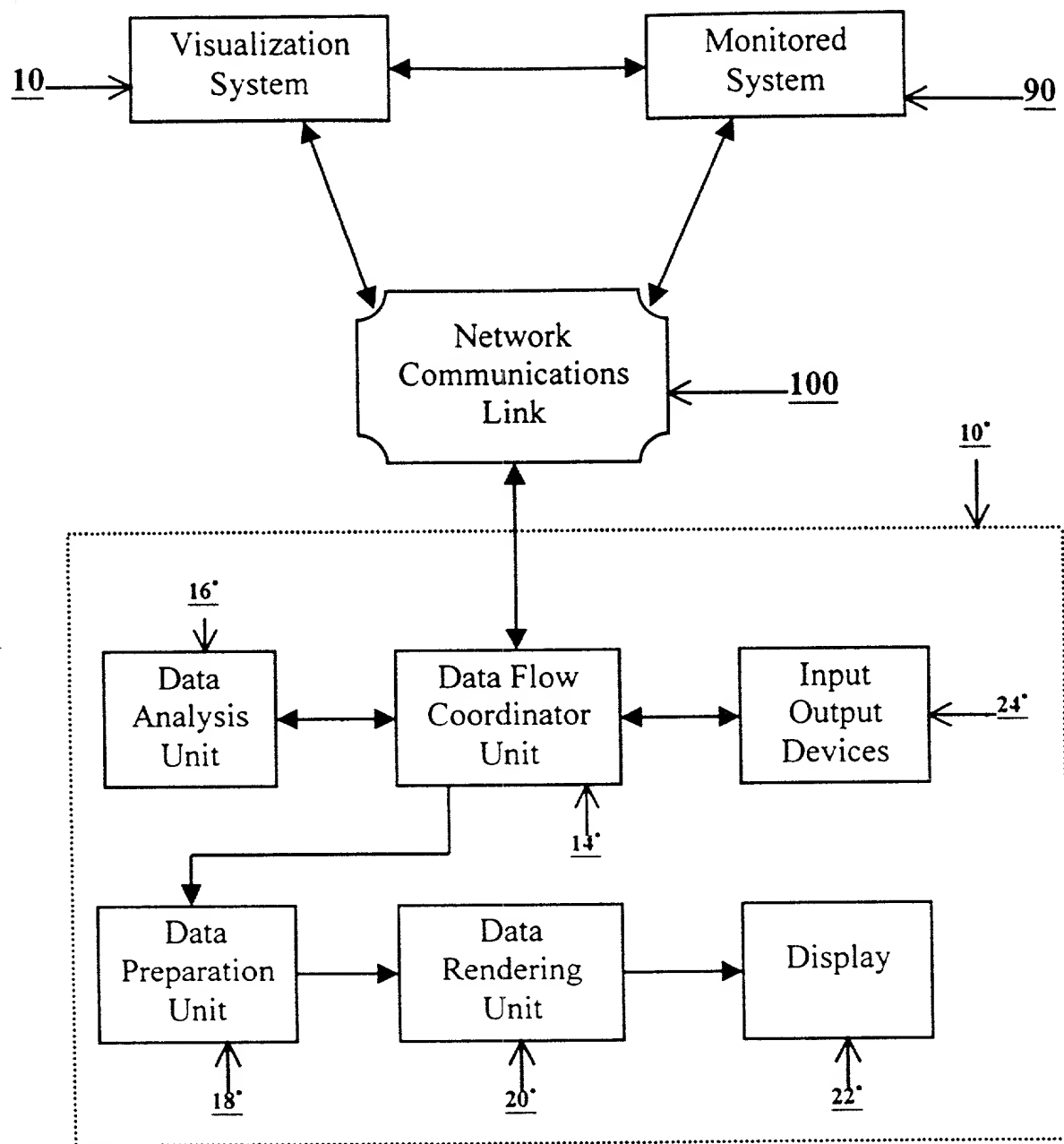


Figure 45. Block Diagram of Remote Link

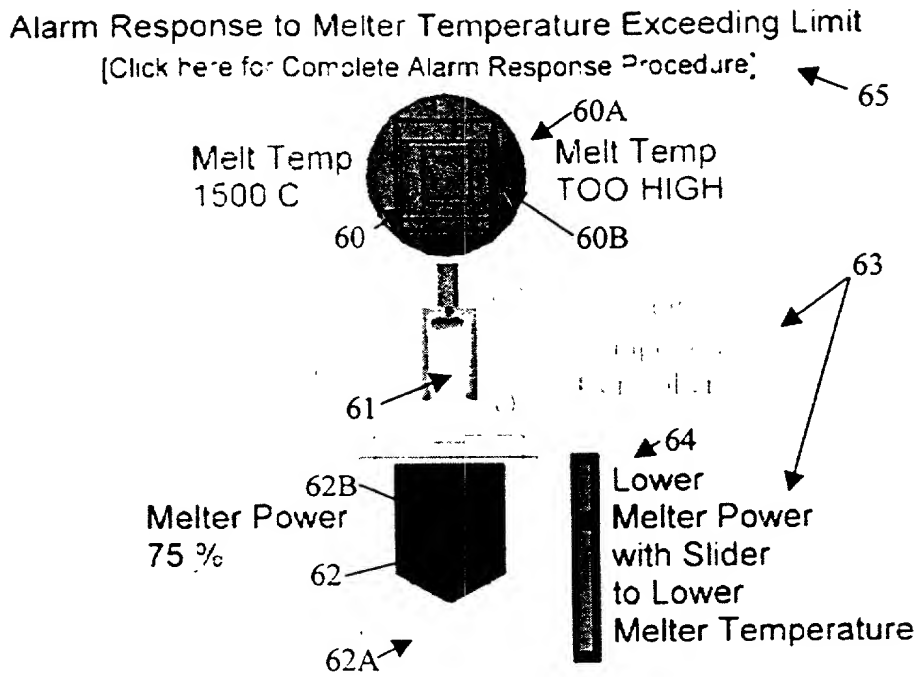


Figure 46. IVRPCS Alarm Response World for Melter Temperature Exceeding Limit

Root Cause Analysis for Melt Temp Safety Interlock  
[Click for Complete Root Cause Analysis]

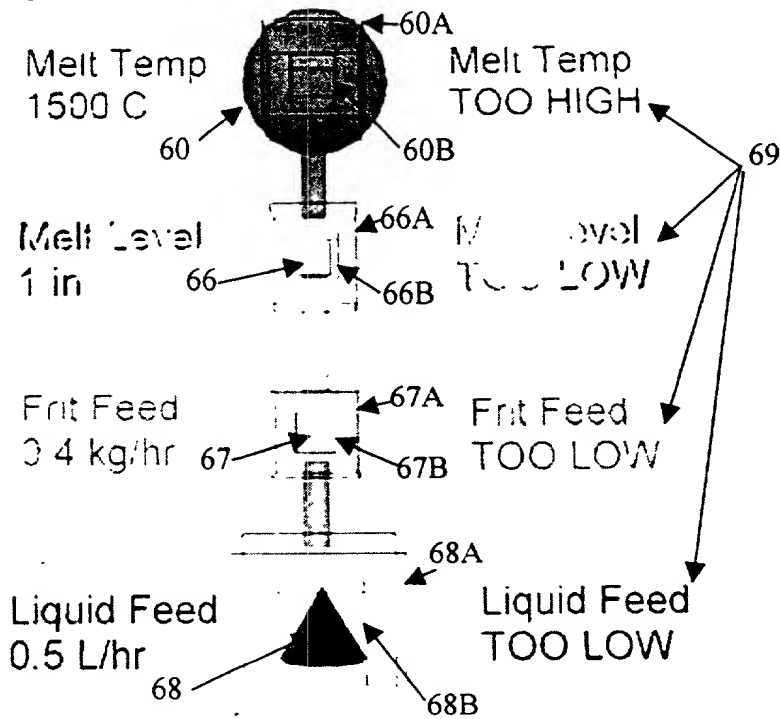


Figure 47. IVRPCS Root Cause Analysis World for Melter Temperature Safety Interlock

UNITED STATES PATENT AND TRADEMARK OFFICE  
DOCUMENT CLASSIFICATION BARCODE SHEET



**Oath/Declaration, Small Entity,  
and Power of Attorney**

8

COMBINED DECLARATION AND POWER OF ATTORNEY  
FOR PATENT APPLICATION

Attorney Docket  
Number: WSH-127  
(SRS-97-085, SRS-97-086)

As a below named inventor, I hereby declare that:

My residence, P.O. address and citizenship are as stated below next to my name.

I believe that I am the original, first and sole inventor of the subject which is claimed and for which a patent is sought on the invention entitled **"METHOD AND SYSTEM FOR INTERACTIVE VIRTUAL REALITY PROCESS CONTROL SIMULATION"** as described in the specification filed herewith.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

Priority  
Claimed

(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
----------	-----------	------------------------	-----	----

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and; insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose material to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status)

POWER OF ATTORNEY: As named inventor, we hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: Paul A. Gottlieb, Reg. No. 26,733; Judson R. Hightower, Reg. No. 26,603; William R. Moser, Reg. No. 24,763; Robert J. Marchick, Reg. No. 27,057; Michael P. Hoffman, Reg. No. 30,183; Virginia B. Caress, Reg. No. 34,062; John T. Lucas, Reg. No. 36,860; Colette Muenzen, Reg. No. 39,784; Harold M. Dixon, Reg. No. 19,526; Murray B. Baxter, Reg. No. 33,646; John B. Hardaway, III, Reg. No. 26,554; Katja Dunbar Peralta, Reg. No. 40,768; Sandra S. Snapp, Reg. No. 41,444; Jacquelyn D. Austin, Reg. No. P-43,478; Oscar A. Towler, III, Reg. No. 33,803; and J. Hebert O'Toole, Reg. No. 31,404; and George E. Darby, Reg. No. P-44,053.

SEND ALL CORRESPONDENCE TO: John B. Hardaway, III, Hardaway Law Firm, P.A., Post Office Box 10107, Greenville, South Carolina, 29603. Telephone: (864) 233-6700.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made of information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

FULL NAME OF FIRST INVENTOR:  
Residence:  
Post Office Address:

William E. Daniel, Jr.  
North Augusta, SC  
462 Crossroad Drive  
North Augusta, SC 29841

Citizenship: USA

Inventor's Signature:

*William E. Daniel, Jr.*

Date:

2-16-99



Combined Declaration and Power of Attorney - continued  
WSH-127 (SRS-97-085)

FULL NAME OF SECOND INVENTOR:

Michael A. Whitney

Citizenship: USA

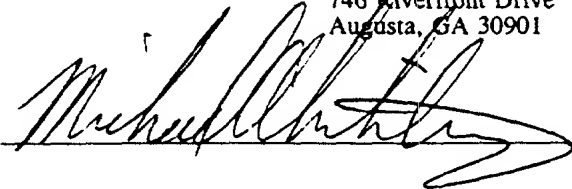
Residence:

Augusta, GA

Post Office Address:

746 Riverfront Drive  
Augusta, GA 30901

Inventor's Signature:



Date:

2/16/99

Patented by the U.S. Patent and Trademark Office

## ASSIGNMENT OF PATENT APPLICATION

Whereas, We, William E. Daniel, Jr. of 462 Crossroad Drive, North Augusta, South Carolina 29841, and Michael A. Whitney of 746 Riverfront Drive, Augusta, Georgia 30901, have invented certain new and useful improvements in a **METHOD AND SYSTEM FOR INTERACTIVE VIRTUAL REALITY PROCESS CONTROL SIMULATION** for which an application for United States Letters Patent is filed herewith, and;

Whereas, Westinghouse Savannah River Company, a South Carolina corporation, having a mailing address of P.O. Box 616, Aiken, SC, 29802, is desirous of acquiring the entire right, title and interest in the same;

Now, therefore, for good and valuable consideration, the receipt thereof is hereby acknowledged, We, the said **William E. Daniel, Jr.** and **Michael A. Whitney** by these presents do assign and transfer unto said **Westinghouse Savannah River Company** the exclusive right to the said invention in the United States and the entire right, title and interest in and to any and all Letters Patent which may be granted in the United States and the world. We hereby authorize and request the Commissioner of Patents and Trademarks to issue said Letters Patent to said Westinghouse Savannah River Company as the assignee of the entire right, title and interest in and to the same, for its sole use and behoof; and for the use and behoof of its legal representatives, to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held by us had this assignment and sale not been made.

Assignment of Patent Application - Page 2

"METHOD AND SYSTEM FOR INTERACTIVE VIRTUAL REALITY PROCESS AND CONTROL SIMULATION"

Executed this 16<sup>th</sup> day of February, 1999.

William E. Daniel, Jr.  
William E. Daniel, Jr.

STATE OF South Carolina )  
COUNTY OF Aiken ) SS.

Before me personally appeared said William E. Daniel, Jr. and acknowledged the foregoing instrument to be his free act and deed this 16<sup>th</sup> day of February, 1999.

Adrian B. Smith  
Notary Public for the State of  
South Carolina

(seal)

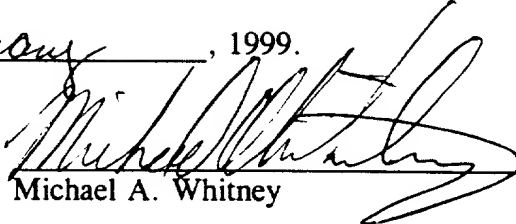
My Commission Expires: 4/1/2001

WSH-127  
SRS-97-085  
SRS-97-086

Assignment of Patent Application - Page 3


"METHOD AND SYSTEM FOR INTERACTIVE VIRTUAL REALITY PROCESS AND CONTROL SIMULATION"

Executed this 16<sup>th</sup> day of February, 1999.

  
Michael A. Whitney

STATE OF South Carolina )  
COUNTY OF Aiken ) SS.

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Notary Public for the State of  
South Carolina

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My Commission Expires: 4/1/2001

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Whereas, Westinghouse Savannah River Company, a South Carolina corporation, having a mailing address of P.O. Box 616, Aiken, SC, 29802, is desirous of acquiring the entire right, title and interest in the same;

Now, therefore, for good and valuable consideration, the receipt thereof is hereby acknowledged, We, the said **William E. Daniel, Jr.** and **Michael A. Whitney** by these presents do assign and transfer unto said **Westinghouse Savannah River Company** the exclusive right to the said invention in the United States and the entire right, title and interest in and to any and all Letters Patent which may be granted in the United States and the world. We hereby authorize and request the Commissioner of Patents and Trademarks to issue said Letters Patent to said **Westinghouse Savannah River Company** as the assignee of the entire right, title and interest in and to the same, for its sole use and behoof; and for the use and behoof of its legal representatives, to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held by us had this assignment and sale not been made.

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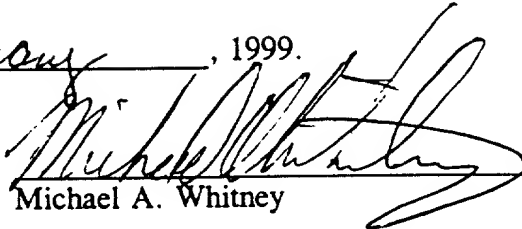
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SRS-97-085  
SRS-97-086

Assignment of Patent Application - Page 3


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COUNTY OF Aiken )

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Notary Public for the State of  
South Carolina

(seal)

My Commission Expires: 4/1/2001

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